

University of Dundee

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Innes, Nicola; Fee, Patrick A.

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Do school-based personal oral hygiene programs reduce caries incidence in children?

Evidence level 1A SR of RCTs

Patrick A Fee, Nicola Innes

School of Dentistry, University of Dundee

Abstracted from

Hujoel PP, Hujoel MLA, Kotsakis GA.

Personal oral hygiene and dental caries: A systematic review of randomised controlled trials. *Gerodontology* 2018; **35**(4):282-289

Address for correspondence: Philippe Pierre Hujoel, Department of Oral Health Sciences, School of Dentistry & Department of Epidemiology, School of Public Health, University of Washington, Seattle, WA, USA. Email: hujoel@uw.edu

Question: Is personal oral hygiene advice (OHA) effective in preventing coronal dental caries?

Data sources: PubMed, EMBASE, and the Cochrane Central Register of Controlled Trials databases were searched for studies published in English between January 1950 and February 2017.

Study selection: Prospective controlled clinical trials investigating the effect of personal oral hygiene interventions on caries experience were included. Studies were excluded where one intervention arm benefitted from additional fluoride products or dietary advice not provided to the control group, or professionally delivered prophylaxis. The authors included randomised controlled trials, with no restrictions on participant characteristics or on primary or permanent teeth. Nonrandomised studies which met all other inclusion criteria were included to assess the robustness of the primary analysis. Non-English studies were excluded, and handling of unpublished studies is not reported.

Data extraction and synthesis: Data were extracted independently by two reviewers and risk of bias assessed using a modified Jadad scale. Heterogeneity was evaluated using the chi-squared statistic and meta-analysis performed.

Results: Three randomised trials were included, involving 681 participants; all children 10 to 13 years old. Two trials were conducted in the USA and one in the UK. Two studies tested school-based daily supervised oral hygiene (including plaque staining and removal and supervised flossing) against control groups; one study tested the same intervention every 2 weeks against controls. Two studies measured Decayed, Missing or Filled Surfaces (DMFS) scores at 3 years and one trial at 29 months. Personal oral hygiene interventions failed to influence the incidence of dental caries (DMFS) = -0.11; 95% confidence interval: (-0.91, 0.69: *P*-value <0.79). Four nonrandomised trials were retained to conduct sensitivity analyses.

Conclusions: Personal oral hygiene interventions delivered to school children failed to show a reduction in coronal dental carious lesion incidence over 3 years when compared to control groups.

Commentary

Dental caries remains a highly prevalent global condition^{1,2} which is largely preventable, with evidence that effective long term dental plaque control can lead to reductions in caries experience³.

Modern concepts in cariology promote the theory that the regular exposure of plaque to fermentable dietary sugars results in repeated conditions of low pH within the oral biofilm. These conditions favour the growth and metabolism of acid-tolerating bacteria while inhibiting beneficial organisms that preferentially grow at neutral pH⁴. Dental caries can be considered a consequence of an ecological shift in the balance of the normally beneficial oral microbiota, driven by lifestyle factors such as diet and cleaning and these oral environment conditions, in turn, drive dysbiosis and subsequent reduction in biofilm pH⁴, promoting dental hard tissue net mineral loss⁵.

The authors of this paper refer to two conflicting hypotheses in caries aetiology: the oral hygiene hypothesis which suggests mechanical biofilm removal from dental surfaces is preventive, and the dental defect hypothesis⁶, which suggests dental carious lesions start in microscopic cracks or crevices in teeth, and that biofilm removal from these crevices is ineffective. The aim of this review was to assess the effect of personal oral hygiene interventions on incidence of dental caries as a way of resolving the conflict between these hypotheses.

The authors searched for studies published between 1950 and February 2017, with the three included studies published between 1976 and 1981. None of the included studies were considered low risk of bias for random sequence generation or allocation concealment, while participant blinding was not possible given the intervention under investigation.

A table of included studies is presented, but there are significant deficiencies which lead to uncertainty for readers when assessing the quality of these studies. Details on the recruitment of schools and participants, and on the included populations are lacking, limiting the generalisability of results. Specifics of the interventions and controls are not reported, and there is no definition of personal oral hygiene interventions provided. There is no detail on the use of fluoridated, non-fluoridated or of any toothpaste in the included studies, and no detail on adherence to the interventions. Without details on the control groups, it is left to the reader to infer what these might be. These deficiencies prevent assessment of the appropriateness of measures to prevent contamination between participants in different intervention arms. Drop-out rates of 15-39% are reported, with no detail on differences between intervention arms.

The outcome measure Decayed, Missing or Filled Surfaces (DMFS) was extracted for each study and the standardised mean difference pooled in a random-effects model. There is no detail at what diagnostic threshold caries was reported. It is recognised that the DMF index is not a perfect epidemiological tool⁷, as it is unable to discriminate between advanced and initial carious lesions, and the Missing component may overestimate the caries increment.

This study concludes that there is a lack of evidence to support the efficacy of personal oral hygiene in preventing or controlling coronal dental caries, and as the authors have presented only two hypotheses, they state support for the dental defect hypothesis. The included studies have shown that school-based personal oral hygiene programs did not influence the incidence of dental caries in a population of 681 school children. It is possible that small therapeutic effects of personal oral hygiene remain undetected in statistically underpowered trials, but this would indicate that the effect was perhaps also not clinically important. It is also difficult to extrapolate the findings in school children to adults with different dental restorative status, gingival recession, saliva flow or systemic diseases.

The results of this review contrast with current concepts in cariology and attempt to question the effectiveness of biofilm removal in the absence of fluoride supplements on reducing caries experience. However, without adequate information relating to the primary studies it is not possible to rule out deficiencies in primary study methodologies that led to the introduction of a combination of selection, performance, intervention adherence and attrition bias, making it difficult for readers to accept the study conclusions. Equally, it also fails to support the theory that brushing alone reduces carious lesion incidence.

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